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Record of pestiferous land snail, *Macrochlamys indica* Godwin-Austen 1883 (Gastropoda: Ariophantidae), on citrus and guava plants in Punjab, India

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Abstract

Occurrence of land snail, *Macrochlamys indica* Godwin-Austen, 1883 (Gastropoda: Ariophantidae) in citrus (Kinnow mandarin and its rootstock *Jatti khatti*) and guava nursery of Punjab, India is reported. This species has been observed as an important mollusc pest of citrus and guava nursery plants in Punjab. Snails avoid hot, dry weather and are active during night when temperature is less. They feed on succulent, tender leaves and create irregular holes with smooth edges on leaves by scraping with their rasp-like tongues. Their peak activity period in Punjab is rainy season. This is the first report of occurrence of this snail in nursery of fruit crops from Punjab, particularly citrus and guava plants. Further studies are required to know its behaviour and economic loss on agricultural crops so as to develop a suitable management strategy.

Keywords: First Report, Fruit Crops, *Macrochlamys indica*, Nursery, Mollusc Pest

Introduction

Many snails are herbivorous, eating plants or rasping algae from surfaces. Land snails are among the pestiferous snails as these are known to cause damage to horticultural and plantation crops in India (Jayashankar *et al*., 2015; Zala *et al*., 2018). Snails are common in almost every habitat and in nurseries, particularly, which is ideal habitat for their survival, given the moisture year-round. The damage occurs at night when temperature is low and moisture level is high, so they usually remain unseen when they are doing their damage. Snails avoid hot, dry weather and bright sunlight; they hide in damp places during the day to avoid predators, as they are too slow in movement and vulnerable. Often the only clues to their presence are their silvery slimy trails and plant damage (Wilen & Flint, 2018).

There are at least 12 pest land snails in India (Aravind per. comm.). There are quite bit efforts to understand the distribution and its impact on crops in India (Raut & Ghose, 1984; Kumar *et al*., 2018). The genus *Macrochlamys* Gray, 1847 includes about 102 species from India. Members of the genus are widely distributed in India and south-east Asia (Ramakrishna *et al*., 2010; Sajan *et al*., 2019). One of the most common indigenous pest land mollusc is *Macrochlymus indica* Godwin-Austen, 1883. It is a species of air-breathing land snails in the family Ariophantidae. Their shell is perforated, depressed, smooth, polished throughout and translucent. It is native to India and has been reported from different parts of the country (Raut & Ghose, 1984; Ramakrishna *et al*., 2010). This species is listed under the quarantine plant pest presenting the greatest threat to agriculture in the USA and is known to be a pest of wide range of vegetables and ornamental crops in India (Raut & Ghose, 1984; Cowie *et al*., 2009; Jayashankar *et al*., 2015). *Macrochlamys indica* has been reported as a serious pest of neem seedlings in the forest nurseries of Rajasthan, India (Kumar & Ahmed, 2000) and has been reported to cause about 10-65 percent mortality to neem seedlings (Ahmed, 1998). It is a voracious plant feeder and able to

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completely devour young seedlings. This species has been considered as serious pest in India and Bangladesh (Sajan *et al*., 2019). So far, very little information is available on this species as a pest of nursery plants of fruit crops. This paper reports the first record of land snail, *M. indica* on seedlings of citrus (Kinnow mandarin and its rootstock *Jatti khatti*) and guava nursery in Punjab.

Material and Methods

During the surveys to record the occurrence and the level of incidence of insect and other pests in nurseries of fruit crops, some snail individuals were collected from MS Randhawa Fruit Research Station, Gangian, District Hoshiarpur and University Seed Farm, Ladhowal, District Ludhiana, Punjab during 2018 and 2019. After rains, snails were found to occur below nursery plants of Citrus (Kinnow mandarin and its rootstock *Jatti khatti*) and guava placed in trenches and also the young seedlings were eaten away. Snails were collected from the nurseries and sent for identification to Ashoka Trust for Research in Ecology and the Environment, Bengaluru, India. It was identified as *Macrochlamys indica* following Blanford & Godwin-Austen (1908).

Results

Order STYLOMMATOPHORA
Superfamily HELICARIONOIDEA
Family ARIOPHANTIDAE
Subfamily MACROCHLAMYDINAE

Genus ***Macrochlamys*** Gray, 1847

Macrochlamys indica Godwin-Austen, 1883

1883. *Macrochlamys indica* Godwin-Austen, *Land and Freshwater Mollusca of India*, **1**: 97, pl. 18, figs. 1- 8b, pl. 21, fig. 1, pl. 25, figs. 9, 10

Materials examined: 10 ex., Mohinder Singh Randhawa Fruit Research Station, Gangian, District Hoshiarpur and University Seed Farm, Ladhowal, District Ludhiana, Punjab, India; 19.xii.2019; coll. Sandeep Singh.

Diagnostic features: Description as per Blanford & Godwin-Austen (1908) is as follows: shell perforate, depressed, smooth, polished throughout, translucent, pale brownish tawny; striations on the shell indistinct, but with microscopic longitudinal impressed lines, slightly flexuous and not close together; spire low, conoid; suture slightly impressed; shell slightly convex above; last whorl not descending, rounded at the periphery and moderately convex beneath; aperture slightly oblique and broadly lunate; peristome thin, with columellar margin curved, oblique, and quite vertical, carried forward and briefly reflected above, animal body purplish grey and elongated.

Whorls 5.5; shell length 18.15±2.12mm; shell width 15.09±2.12mm, whorls 5.5 (n=10).

Distribution: INDIA: It is widely distributed across almost all states except for drier regions in the North Western India (Raut & Ghose, 1984; Mitra *et al*., 2004). The confirmed reports are from, Andaman Islands (Raut & Ghose, 1984), Assam (Borkakati *et al*., 2009), Bihar, Delhi, Maharashtra, Odisha, West Bengal, Tamil Nadu (Kumar & Ahmed, 2000; Palit & Palit, 2014), Kerala, Punjab (Kaur & Chhabra, 2011), Karnataka (Jayashankar *et al*., 2015). *Elsewhere:* Nepal (Budha *et al*., 2015), Bangladesh (Jahan *et al*., 2002), Sri Lanka (https://www.nhm.ac.uk/our-science/data/tropical-land-snails/taxa.dsml), pest in many parts of the world.

Host Plants: It has been reported as a pest of several horticultural and agricultural plants which includes cucurbits (*Luffa* sp.), beans (*Phaseolus vulgaris*), lettuce (*Lactuca sativa*), cole crops (*Brassica* sp.), drumstick (*Moringa oleifera),* purple amaranth (*Amaranthus blitum),* Okra (*Abelmoschus esculentus*), Marigold (*Tagetes* sp.), Bottle gourd (*Lagenaria vulgaris*) and Daisy (*Chrysanthemum* sp.) (Raut & Ghose, 1984), paper flower (*Bougainvillea* sp.), Ribbon grass (*Phalaris arundinacea*) and Money plant (*Epipremnum aureum*) (Subba Rao, 1975) and neem seedlings (Kumar & Ahmed, 2000).

Discussion

In the present study, *M. indica* was observed on young seedlings of citrus and guava in the nursery at Fruit Research Station, Gangian, District Hoshiarpur and University Seed Farm, Ladhowal, District Ludhiana, Punjab during 2018 and 2019. Adults were found hidden below the seedlings placed in trenches as they prefer damp and dark areas. They remain hidden during the day in holes, crevices, grass dumps and other secluded areas and become highly active during night. Their photonegative habit is thought to be evolved as a response to conserve moisture (Raut, 1977). Snails aestivate or hibernate during adverse conditions and this aestivating/hibernating population of snails become responsible for restocking an infested area, thus of great significance. Snails which survived the adverse climatic conditions become active with the onset of rains and resume their biological activities. They prefer

slightly alkaline sandy soils having pH of 7.0-8.0 and lay eggs in moist places (Kumar & Ahmed, 2000). The snails deposit their eggs either inside loose soil or beneath the debris. They lay eggs in 50-60 batches with about 14-17 eggs per batch (Sudhakar, 2013).

It was observed that the young snails prefer tender leaves, stem and avoid harder portions of plant, while older ones can damage both young as well as grown up seedlings. They create irregular holes with smooth edges on leaves by scraping with their rasp-like tongues. Small succulent plant parts are easily clipped by snail feeding. Sometimes, they also cause damage to bark and fruits. Citrus nursery plants are especially susceptible to damage of snails (Figure 1). It is interesting to note that the Citrus leaves despite having essential oils in the leaves are susceptible for attack. Damaged leaves have large chewed areas along the margins (Figure 2). Numerous holes were observed on leaves of guava nursery plants. Their peak activity period in Punjab is during the rainy season (Kaur *et al*., 2017).

Snail feed voraciously on main tender portion of the stem above collar region resulting in girdling of stem. The debarked stem becomes very weak, fragile and easily breaks off with the wind. The seedlings die subsequently due to the damage to the cambium. *Macrochlamys indica* species was first time reported from Rajasthan as a pest of neem seedlings (Kumar & Ahmed, 2000). During 2017, this species of snails was also recorded from Americas and Caribbean basin, Brazil region as an alien Indo-Asian snail thought to be introduced through trade of citrus fruit seedlings (Luz, 2017).

Raheem *et al*. (2014) reported *M. indica* from the Western Ghats ranging across East India through West Bengal, Odisha to Bangladesh. *M. indica* occurs in high abundance in agricultural, horticultural and plantation crops. They are also common in gardens, homesteads, nurseries and semi-natural areas. It was recorded from agri-horticultural ecosystems of Bengaluru region of India (Jayashankar *et al*., 2015). In Punjab, *M. indica* has been reported to occur in nurseries of ornamental plants such as *Dracaena green*, money plant, *Bougainvillea* sp., *Phyllodendron* sp. and poinsettia (Kaur & Chhabra, 2011). This species has not been reported earlier from nurseries of fruit crops in Punjab, India and this is the first report of the occurrence of land snail, *M. indica* in nursery of citrus and guava from Punjab, India.

There is lack of information on the ecology and pest status of land snail, *M. indica* in particular, despite availability of vast literature on its taxonomy (Aravind, *et al*., 2010). Since the snails are reported to have increased in population (Pillai & Koshy, 1970), further studies are needed to understand their behaviour and damage potential, so as to develop a suitable eco-friendly strategy for their management in fruit nursery plants. Also, there is an urgent need to study economic losses caused by this snail across India. This species is of International concern due to its pestiferous nature. Countries like USA and Australia are strictly quarantining the agricultural and horticultural produce coming from India and other countries where this species occurs.

Figure 1. Snail on Kinnow mandarin nursery plant.

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Figure 2. Snail damage on *Jatti Khatti,* (*Citrus jambhri*) nursery plant.

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